REMARKS

Claims 1 – 11 are pending in this application.

Claim 3, as well as claims 6-8 were indicated to be allowed (or allowable) if rewritten in independent form, including all of the limitations of the base claim and any intervening claims. Claim 3 has been so rewritten and, therefore, it is submitted that claims 3 and 6 – 8 should be allowed.

Rejection of Claims 1, 9 and 11 under 35 USC § 102 (e)

Independent claim 1, as well as dependent claims 9 and 11 have been rejected under 35 USC 102 (e) as anticipated by Davison et al. The rejection based on Davison is respectfully traversed and allowance of these claims is requested for the following reasons.

Claim 1 has been modified for improved readability and to clarify certain aspects of the present invention.

The presently claimed invention relates to methods for constructing a 3D scene model by analyzing image sequences. Each image corresponds to a viewpoint defined by a position and an orientation. A depth map corresponding to the depth in 3D space of the pixels of each image is calculated. A resolution map corresponding to the 3D resolution of the pixels of each image is then calculated from the depth map. Each pixel of a current image is then matched with a pixel of an other image of the sequence. Pixels relating to one and the same point of the 3D scene are determined by projecting the pixel of the current image onto the other image. A pixel of the current image is selected depending on its resolution and on that of the pixels of other images of the sequence matched with this pixel. A 3D model is then constructed from the selected pixels. The present invention relates to a process which allows for improvement in navigation of a virtual scene.

Requirements for a Rejection Under § 102

In order to anticipate a claim under 35 U.S.C. § 102 (e), It is required that the (entire) invention (that is, all elements) must be described in the cited reference. This principal has been described in CAFC decisions which are set forth at MPEP page 2100 – 76 as follows:

"To anticipate a claim, the reference must teach every element of the claim". That is,

"A claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference." Verdegaal Bros. v. Union Oil Co. of California, 814 F.2d 628, 631, 2 USPQ2d 1051, 1053 (Fed. Cir. 1987)."

"The identical invention must be shown in as complete detail as is contained in the ----claim." Richardson v. Suzuki Motor Co., 868 F.2d 1226, 1236, 9 USPQ2d 1913, 1920 (Fed. Cir. 1989). "

"The elements must be arranged as required by the claim, but ----identity of terminology is not required." In re Bond, 910 F.2d 831, 15 USPQ2d 1566 (Fed. Cir. 1990)."

In the rejections of the claims, the Examiner concludes that :

"It has thus been shown that the ---- method of Davison et al. sufficiently conforms to the method proposed by the Applicant in claim 1. Therefore, the teachings of Davison et al. anticipate the method of claim 1."

Specifically, considering Davison, that reference lacks important elements of claim 1 and the elements of Davison are not "arranged as required by the claim" (In re Bond, supra). Therefore, Davison cannot be said to anticipate claim 1 (or claims dependent thereon).

Regarding the arrangement of elements in Davison, in column 7, lines 21 - 59, Davison describes his sequence of steps from "step S2" through "step S14". Further steps (and intermediate detailed steps) are described in the following paragraphs. It is clear from Davison's description that his method steps 2, 4, 6, 8, 10, 12, 14 occur in numerical order. Specifically, Davison states,

beginning at col. 7, line 34 and following:

"At step S6, the transformations between the different camera positions from which the images were taken ---- are calculated ----".

"At step S8, using the calculated camera transformations from step S6 , further features are matched in the images (----to look for a point matching a given point in another image)".

"At step S10, points in three dimensional modeling space representing actual points on the surface of object 24 are generated ---."

"In step S12, the points in three dimensional space produced in step S10 are connected to generate three-dimensional surfaces, representing a three-dimensional model of object 24."

"In step S14, the 3D model produced in step S12 is processed to display an image of the object 24 from a desired viewing direction on display unit 18.".

(emphasis of sequence added).

Applicant's conclusions regarding the order of Davison's process steps is confirmed by Davison at col. 41, lines 32 – 39 where it is stated:

"Referring again to Fig. 3, after performing initial feature matching (step S4), calculating the camera transformations (step S6), and performing constrained feature matching (step S8) in the manner described above, CPU 4 uses the results to generate 3D data at step S10. The aim of this process is to generate a single set of points in a three-dimensional space correctly positioned to represent points on the surface of the object 24." (emphasis added).

In the rejection of claims 1, 9 and 11, however, the Examiner states that the first step of rejected claim 1 ("calculating, for each image, a depth map corresponding to the depth, in 3D space, of pixels of the image") is satisfied by "Davidson et al. Fig. 3, step S10 and note depth is inherent to 3D data".

In fact, Davison does not calculate, for "each image corresponding to a viewpoint defined by its position and its orientation", as defined in Applicant's

claim preamble, "a depth map corresponding to the depth, in 3D space, of pixels of the image"(claim 1).

Prior to Davison's step S10, "each image corresponding to a viewpoint defined by its position and its orientation" has already been processed according to Davison's steps S2, S4, S6 and S8 (two sets of feature matching and one set of camera transformations) . Thus, it is clear that Davison's step S10 operates on transformed information and is not for "calculating, for each image, a depth map corresponding to the depth, in 3D space, of pixels of the image" (claim 1). In fact, unlike the requirements of claim 1, Davison's step S10 cannot be directed to "calculating, for each image, etc." since those images have been transformed to something else before step S10 occurs. Instead, according to Davison, his step S10 is intended "to generate a single set of points in a three dimensional space correctly positioned to represent points on the surface of the object 24" (Davison, col. 41, lines 37 – 39) .

Since Davison never mentions and does not produce "a depth map" "for each image" with the "image corresponding to a viewpoint, etc.", it is also clear that Davison does not disclose or suggest "calculating, for each image, a resolution map ---- from the depth map---". The Examiner relies on col. 43, lines 3 – 4 and col. 44, lines 1 – 40 of Davison for a disclosure of this element of claim 1.

However, Davison makes it very clear in the cited text that he is not discussing "resolution" but, rather is discussing "errors in the calculated camera transformations and the matches themselves" such that a number of points ("a cluster") are produced "representing the same physical point on the surface of object 24" (emphasis added). Davison strives to reduce these errors to zero and to eliminate any "cluster" in favor of a single point. This has nothing to do with resolution and there is simply no "resolution map" disclosed or suggested by Davison "for each image" , either "from the depth map" or otherwise.

In addition, the Examiner relies on step S8 of Davison for a disclosure of "matching a pixel of a current image with a pixel of an other image of the sequence, said pixels relating to one and the same point of the 3D scene,

by projecting the pixel of the current image onto the other image". However, in Davison, as noted above, step S8 preceded step S10. In Applicant's claims, the step of "matching a pixel, etc." follows the steps of "calculating a depth map" and "calculating a resolution map from the depth map" (for each image). Thus, even if the Examiner was correct in stating that S10 constitutes calculating a depth map and if he was correct that the inter-point distances (errors) in Davison's points that remain following step S10 relate to resolution, since step S8 precedes either of those operations in Davison, Davison cannot be said to anticipate the present claim 1 (the order of steps and, therefore, the arrangement of elements is different s that the results are different).

Finally, contrary to the Examiner's position, there is no disclosure or suggestion in Davison of "selecting a pixel of the current image depending on its resolution and on that of the pixels of other images of the sequence matched with said pixel". As pointed out above (and stated by Davison), the separation or dispersion of the several points in a "cluster" represent a single image point and have nothing to do with "resolution" but, rather, represent errors in transformation or the like in Davison's process. The last – quoted element of claim 1 ("selecting a pixel ---depending on its resolution, etc.") is therefore neither disclosed nor suggested in the cited reference.

Claims 9 and 11, as well as all other claims dependent, directly or indirectly on independent claim 1, distinguish over and are not anticipated by Davison et al. for the same reasons as stated above in connection with claim 1.

Rejection of Claim 2 under 35 USC § 103 (a)

Claim 2 has been rejected under 35 USC 103 (a) as unpatentable over Davison et al. in view of Azarbayejani (US 5,511,153).

As was demonstrated above, Davidson fails to show several elements and the arrangement of elements as claimed in independent claim 1. In the present rejection under 35 USC 103 (a), the Examiner specifically relies on his earlier incorrect conclusion that "Davidson et al. selects pixels depending on

the resolution".

It is respectfully submitted that, as demonstrated above, "cluster" in Davison has no relationship to "resolution" as set forth in claim 1. For this reason alone, as well as the lack of additional elements indicated above ("depth map", "resolution map", etc.), there is no basis for any rejection of dependent claim 2 based on a combination of Davison and Azarbayejani and it is requested that such rejection be withdrawn.

Rejection of Claims 4 and 5 under 35 USC § 103 (a)

Claims 4 and 5 have been rejected under 35 USC 103 (a) as unpatentable over Davison et al. in view of McAllister et al. ("Real - Time Rendering Techniques of Real World Environments").

As was demonstrated above, Davidson fails to show several elements and the arrangement of elements as claimed in independent claim 1. In the present rejection under 35 USC 103 (a), the Examiner concludes, in the rejection of claim 4, " Davison et al. disclose a 3D model construction method that sufficiently conforms to the method of claim 1" and, in the rejection of claim 5, " ---combining the teachings of McAllister et al. and Davison et al. -----yields a 3D modeling method that conforms substantially to that of claim 5". In each case, however, McAllister is not seen to correct or supplement any of the deficiencies noted above regarding the lack of elements (and arrangement) in Davison et al. that are specifically recited in claim 1.

It is respectfully submitted that, as demonstrated above, the complete absence of a "depth map", "a resolution map of the pixels from the depth map" and "selecting a pixel depending on its resolution –" as set forth in claim 1 are not shown or suggested by any possible combination of Davison with McAlliater . For this reason alone, as well as the lack of additional elements indicated above, there is no basis for any rejection of dependent claims 4 and 5 based on a combination of Davison and McAllister and it is requested that such rejection be withdrawn.

Rejection of Claim 10 under 35 USC § 103 (a)

Claim 10 has been rejected under 35 USC 103 (a) as unpatentable over Davison et al. in view of La Roux et al. ("An Overview of Moving Object Segmentation in Video Images", IEEE, 1991).

The Examiner concludes that the teachings of Davison et al. and La Roux et al. can be combined to yield a method "that conforms substantially to that of claim 10".

However, as was demonstrated above, Davidson fails to show several elements and the arrangement of elements as claimed in independent claim 1. In this case, La Roux is not seen to correct or supplement any of the deficiencies noted above regarding the lack of elements (and arrangement) in Davison et al. that are specifically recited in independent claim 1.

It is respectfully submitted that, as demonstrated above, the complete absence of a "depth map", "a resolution map of the pixels from the depth map" and "selecting a pixel depending on its resolution –" as set forth in claim 1 are not shown or suggested by any possible combination of Davison with La Roux. For this reason alone, as well as the lack of additional elements indicated above, there is no basis for any rejection of dependent claim 10 and it is requested that such rejection be withdrawn.

CONCLUSION

In view of the lack of any disclosure in Davison et al. of specifically claimed elements as noted above, and further, in view of the difference in the arrangement of steps in the claimed invention as compared to Davison, it is submitted that Davison does not anticipate the invention set forth in independent claim 1.

Similarly, the noted deficiencies of Davison et al. are not found in any of the cited secondary references.

In view of the foregoing amendments and Remarks reconsideration and allowance of claims 1 – 11 are requested.

Respectfully submitted,

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